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SATO ★

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Desk top thermal printer - has arrangement for selectively removing printed labels from backing sheet

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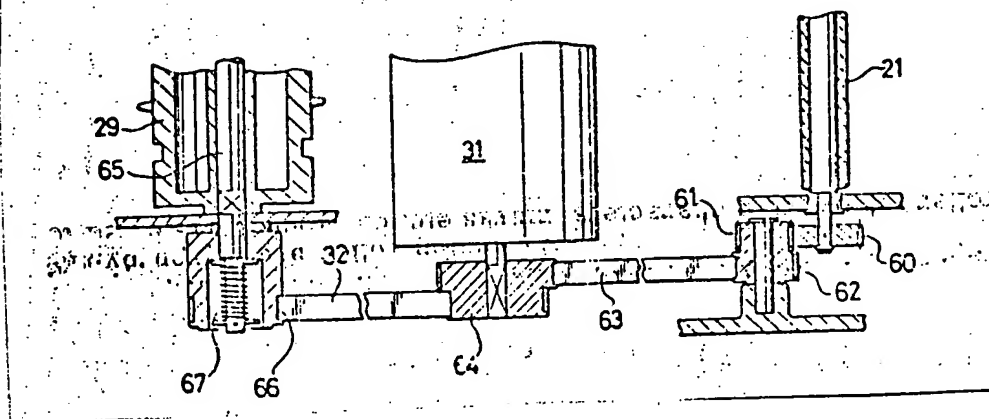
The printer includes a main unit having a passage for a continuous label strip consisting of thermosensitive labels detachably attached to a backing sheet. A device retains a roll of the label strip. The printer also includes a thermal label detector, a thermal label strip transfer mechanism having a stepping motor and a sheet drive roller and a thermal printer having a printing head and a platen roller for printing characters, marks etc. on labels transferred to pass between the head and the roller.

The sheet drive roller and the platen roller are driven by the stepping motor. The printer also includes a label peeling device, a data input unit, a data display and a controller.

ADVANTAGE - Is freely portable and can be placed on any available surface. (16pp Dwg.No.1/4)

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128, Theobalds Road, London WC1X 8RP, England

US Office: Derwent Inc. Suite 500, 6845 Elm St. McLean, VA 22101

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BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to a desk-top thermal printer and particularly to a desk-top thermal printer capable of selectively removing or not removing printed labels from their backing sheet.

Description of the Prior Art

In recent years thermal printers have come into use as output devices in wide-ranging applications. In one particular application the thermal printer is used to print bar codes on labels and the labels are in turn used in various ways for data processing and system administration. In this application, depending on the place where the printed labels are used and the type of processing system employed, there are cases where the printed labels have to be peeled off one by one from their backing sheet before use and other cases where it is necessary for the printer to print out a predetermined number of labels in a continuous strip without peeling them off from the backing sheet. Up until now, however, there has not been available a thermal printer which can be used in both of these cases, i.e. it has been necessary to keep on hand two different types of thermal printers, one for the first type of operation and one for the second. This is disadvantageous in terms of both equipment cost and operational efficiency.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a handy desk-top thermal printer for individual use which is

freely portable and can be easily placed on any available surface. Another object of the invention is to provide such a desk-top thermal printer which is capable of both a first mode of operation for peeling printed labels from their backing sheet and affixing them on objects and a second mode of operation for feeding out printed labels as attached to their backing sheet.

The present invention attains these objects by providing a desk-top thermal printer comprising a main unit having a passage for passing a continuous label strip consisting of thermosensitive labels detachably attached to a backing sheet and a flat bottom surface for supporting the main unit on a freely selectable flat surface, a retaining means for retaining a roll of the label strip, a thermal label detecting means, a thermal label strip transfer means having a stepping motor and a sheet drive roller, a thermal printing means having a thermal printing head and a platen roller for thermally printing characters, marks or the like on the thermosensitive labels transferred by the transfer means to pass between the thermal printing head and the platen roller, a label peeling means, a data input means, a data display means and a control means for controlling the operation of the aforesaid means, the sheet drive roller and the platen roller being driven by the stepping motor.

The desk-top thermal printer according to the present invention can be made small in size and easy to carry from place to place, can be used for label printing

simply by placing it on any available flat surface, and has its sheet drive roller and platen roller driven by a stepping motor. It can therefore print and feed out labels in different modes of operation, making it usable as an output device for a wide range of purposes in various fields of application.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of an embodiment of the desk-top thermal printer according to this invention,

Figure 2 is a sectional side view of the same embodiment,

Figure 3 is a perspective view of a segment of the label strip, and

Figure 4 is a sectional side view of an important part of the embodiment illustrated in Figures 1 and 2.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Figures 1 to 4, the desk-top thermal printer 1 comprises a main unit 2 having a horizontal top surface 3, a bottom surface 4, an inclined top surface 5, a front surface 6 and left and right side surfaces 7. The horizontal top surface 3 is provided with a keyboard 8 having a number of keys for use as data input means, while the portion of the inclined top surface 5 adjacent to the horizontal top surface 3 is provided with a display 9 serving as a data display means. A pair of start buttons 10 (only one shown) are provided one on each of the side surfaces 7 at positions below the horizontal top surface 3

and an open/close button 11 is positioned on one of the side surfaces 7 at the upper portion thereof. The front surface 6 has a cover 12 for closing a housing for a battery 34 whose function will be explained later and an outlet 13 for permitting a backing sheet S to pass out of the main unit 1. At the upper edge of the outlet 13 is positioned a cutter 14.

As can be seen from Figure 2 showing the internal structure of the thermal printer 1, a retaining member 15 for retaining a roll R of label strip T is positioned below the inclined top surface 5 and the label strip T passes from the roll R into a label strip passage 17 as guided by a guide roller 16. As shown in Figure 3, the label strip T consists of a backing sheet S having a plurality of thermosensitive labels L, each having an adhesive back surface, detachably adhered continuously along its length. The label strip T passes over a guide roller 18 and a label sensor 19 and comes between a thermal printing head 20 and a platen roller 21, at which position the thermal printing head 20 prints the label L with characters, marks or the like which, depending on the data input via the keyboard 8, may form a bar code B as shown in Figure 3. The thermal printing head 20 is rotatably supported on a pin 22 and is so arranged that the pressure of the head can be adjusted by means of a spring 23 and a screw 24.

In one mode of operation, after the thermal printing head 20 completes printing of the label L, only

the backing sheet is sharply bent and redirected at a sheet bending pin 25, while the label L is peeled from the backing sheet S by a combination of this sharp bending action with the action of an auxiliary peeling roller 26. The peeled label L is then fed out of the main unit 2 so as to come to rest on a label receiving cushion 27. On the other hand, the backing sheet S proceeds over a guide roller 28 and comes into engagement with a sheet drive roller 29 by which it is discharged outside of the main unit 2 through the outlet 13. The length of the backing sheet S that has passed out of the main unit 2 can be cut off as convenient by the cutter 14.

When a roll R of the label strip T is to be loaded in the main unit 1, the open/close button 11 is operated to allow the section including the platen roller 21 to swing upwardly about a pin 30, making it possible to insert a new roll R.

As shown in Figure 4, the platen roller 21 is linked with a stepping motor 31 through a plunger gear 60, an idle gear 61, an idle pulley 62, while the sheet drive roller 29 is linked with the stepping motor 31 through a timing belt 63 and driving pulley 64, a shaft 65, a gear 66, a slip mechanism 67 and a timing belt 32. Stepped rotation performed by the stepping motor 31 upon the receipt of driving pulses is transmitted to the platen roller 21 and the sheet drive roller 29, causing them to rotate as indicated by the arrow in Figure 2.

The control circuit 33 is provided inside the main unit 2 at a position beneath the keyboard 8. This control circuit 33 is electrically connected by means not illustrated in the figures to the label sensor 19, the thermal printing head 20, the stepping motor 31, the keyboard 8, the display 9, the start buttons 10 and the battery 34 housed in a compartment under the control circuit 33.

The horizontal top surface 3 of the main unit 2 is provided with a key guard 35, and the bottom surface 4 is provided with two pairs of legs 36 (only one pair shown) for supporting the thermal printer 1 on any available flat surface D. As shown in Figure 1, the side surfaces 7 are respectively provided with recessed portions 37 (only one shown) for making it easier to hold the thermal printer 1 in one hand while operating the keys of the keyboard 8 with the other. Further, as shown in Figure 3, the backing sheet S of the label strip T is provided with cuts C for engagement by the sheet drive roller 29.

The operation of the thermal printer will now be explained. The printer 1 can be placed on any flat surface D during operation and can be easily transported by hand from one such flat surface to another, whereby it becomes possible for the operator to print labels at whatever place is convenient.

When the thermal printer 1 is operated in the mode in which the labels are separated from the backing sheet S

one by one, only the backing sheet S is sharply bent and redirected at the sheet bending pin 25, thus causing the label L to peel off the backing sheet S.

In this mode of operation, at the time of loading the roll R of label strip T into the thermal printer 1 the label backing sheet S of the label strip T is inserted between the guide roller 28 and the sheet drive roller 29, whereafter any slack in the backing sheet S between the sheet bending pin 25 and the sheet drive roller 29 can be taken up by rotation of the sheet drive roller 29. Then, since the gear 66 associated with the sheet drive roller 29 is provided with the slip mechanism 67, the backing sheet S is thereafter fed in the direction of the outlet 13 by slipping rotation of the sheet drive roller 29.

To begin the operation, the operator presses the keys of the keyboard 8 to input the desired data. As the input data appears on the display 9, its accuracy can easily be confirmed. Next, when one of the start buttons 10 is pushed, the stepping motor 31 rotates the sheet drive roller 29 causing it to advance the label strip T and at the same time the thermal printing head 20 prints one of the labels L with a bar code B or other desired pattern. As the portion of the backing sheet S bearing the printed label L bends around the sheet bending pin 25, the label L is peeled off the backing sheet S and is discharged onto the label receiving cushion 27. The operator can then remove the peeled-off label L from the main unit 2 with his fingers

and affix it on an object (not shown) such as a piece of merchandise or a parcel for delivery, whereby it can be used for data administration. Alternatively, the object may be drawn across the top of the thermal printer in the direction indicated by the arrow A so as to directly affix the printed label L thereon.

When the thermal printer 1 is to be operated in the mode in which the labels are not separated from the backing sheet S but are fed out from the inclined top surface 5 together with the backing sheet S, it is sufficient to thread the label strip T so that the backing sheet S is not bent back by the sheet bending pin but is discharged together with the labels L in the direction of the label receiving cushion 27. In this case, the label strip T retained between the platen roller 21 and the thermal printing head 20 is conveyed by the rotation transmitted to the platen roller 21 by the stepping motor 31.

Instead of using the thermal printer 1 as placed on the flat surface D, it can also be used as held in the hand. In this case, the operator grasps the thermal printer at the recessed portions 37 with, for example, his left hand and operates the keys of the keyboard 8 with his right hand.

Although the aforesaid embodiment has been described as having a keyboard as the data input means, other arrangements are also possible. For example, as shown by a phantom line in Figure 2, it is possible to provide an

input terminal 42 in connection with the control circuit 33 and to use this terminal 42 for feeding data to the control circuit 33 directly from a master device or a central computer, whereby the thermal printer 1 can function as a computer terminal device. Alternatively, a reader, e.g. a pen reader, can be connected to the input terminal 42 and data obtained by reading OCR characters, bar codes or the like with the reader can be directly input to the control circuit 33. Moreover, the control circuit 33 can be constituted to include a ROM (read only memory) in which a control program and/or various data are stored. In this case, the control program and data can be easily changed by changing the ROM.

Also, although in the aforesaid embodiment the stepping motor 31 and the sheet drive roller 29 are provided separately, it is alternatively possible to build the stepping motor 31 into the sheet drive roller 29 and to drive the platen roller 21 from here via the timing belt 63 or the like. In this case, it becomes necessary to provide the slip mechanism 67 in association with the platen roller 21 instead of the sheet drive roller 29, or to provide a drive switching mechanism such as a change-over lever for making and breaking the connection between the power source and the platen roller 21. In the latter case, the label strip T is first fed out by the platen roller 21 and then with the platen roller 21 disconnected from the power source by means of the drive switching mechanism the backing sheet

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S is conveyed by the sheet drive roller 29. Next, after the slack in the backing sheet S has been taken up, the platen roller 21 is again connected with the drive source.

CLAIMS

1. A desk-top thermal printer comprising a main unit having a passage for passing a continuous label strip consisting of thermosensitive labels detachably attached to a backing sheet and a flat bottom surface for supporting the main unit on a freely selectable flat surface, a retaining means for retaining a roll of the label strip, a thermal label detecting means, a thermal label strip transfer means having a stepping motor and a sheet drive roller, a thermal printing means having a thermal printing head and a platen roller for thermally printing characters, marks or the like on the thermosensitive labels transferred by the transfer means to pass between the thermal printing head and the platen roller, a label peeling means, a data input means, a data display means and a control means for controlling the operation of the aforesaid means, the sheet drive roller and the platen roller being driven by the stepping motor.

2. A desk-top thermal printer according to Claim 1 wherein said sheet drive roller is driven by said stepping roller via a slip mechanism.

3. A desk-top thermal printer according to Claim 1 wherein said stepping motor is built into said sheet drive roller.

4. A desk-top thermal printer according to Claim 3 wherein said platen roller is driven by said stepping motor via a slip mechanism.

5. A desk-top thermal printer according to Claim 3 further provided with a drive switching mechanism for making and breaking the connection between said platen roller and said stepping motor.

6. A desk-top thermal printer according to Claim 1 wherein said stepping motor is controlled by said control means on the basis of the operation a start switch and the output from said thermal label detecting means to advance said label strip by one label at a time.

7. A desk-top thermal printer according to Claim 1 wherein said label peeling means is a sheet bending pin for peeling said labels from said backing sheet by sharply changing the direction of travel of said backing sheet and an auxiliary peeling roller for directing the labels peeled from said backing sheet in a different direction from the direction of travel of said backing sheet.

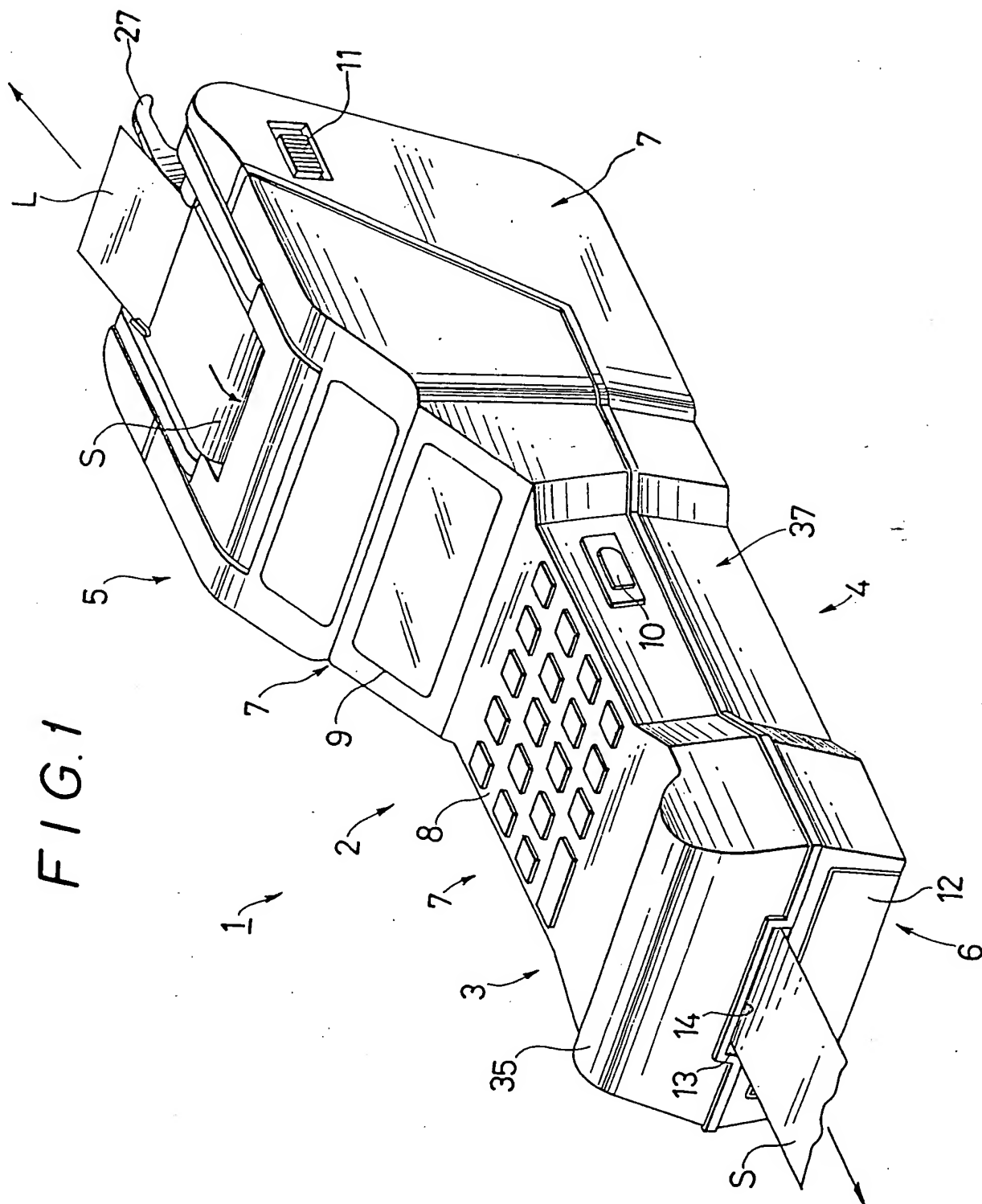
8. A desk-top thermal printer according to Claim 1 wherein said data input means is a keyboard.

9. A desk-top thermal printer according to Claim 1 wherein said data input means is a data input terminal for connection to an external data input device.

10. A desk-top thermal printer according to Claim 1 wherein said control means comprises a read only memory having a control program stored therein.

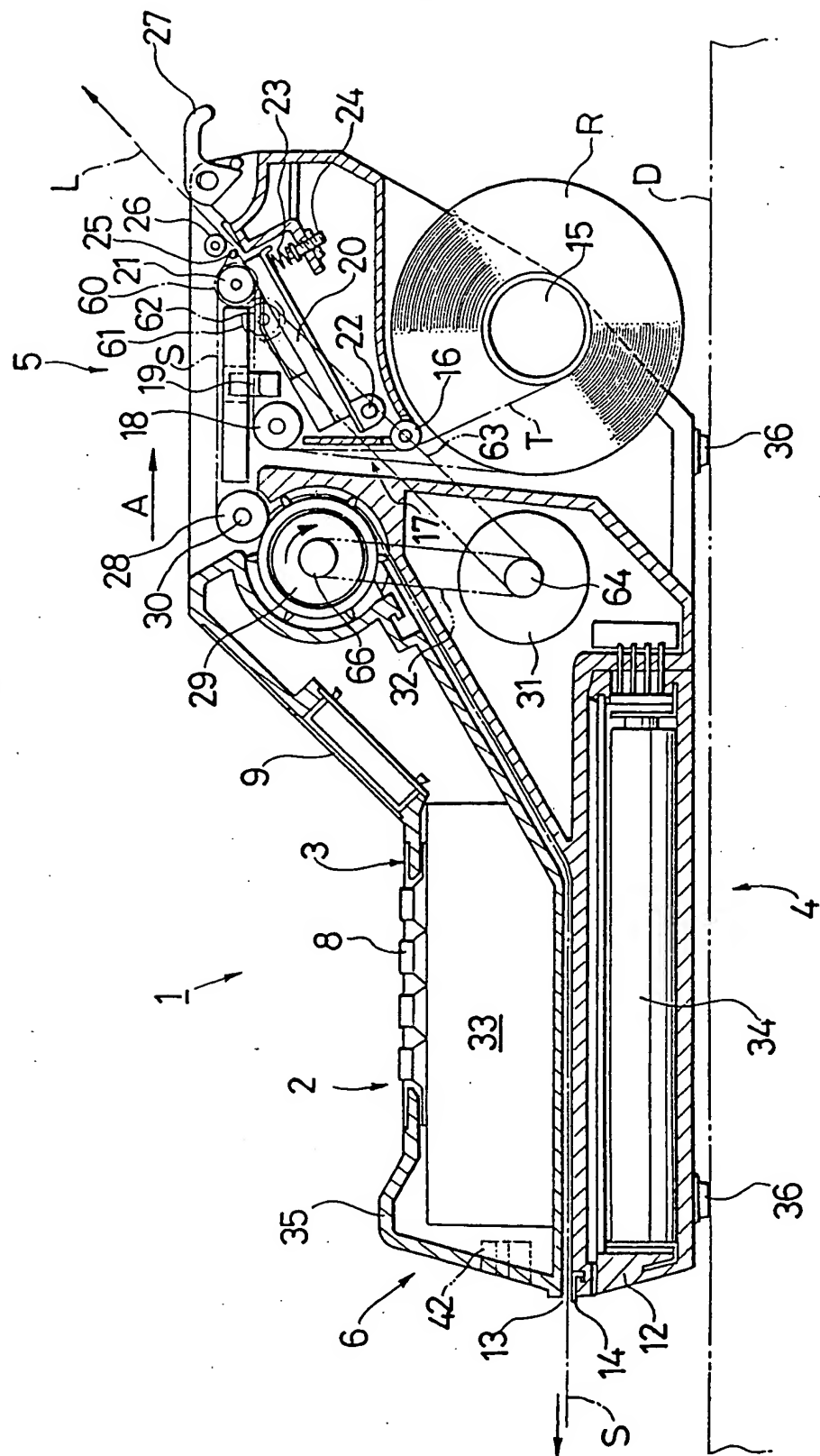
11. A desk-top thermal printer according to Claim 10 wherein said read only memory is interchangeable.

1/3



2/3

FIG. 2



3/3

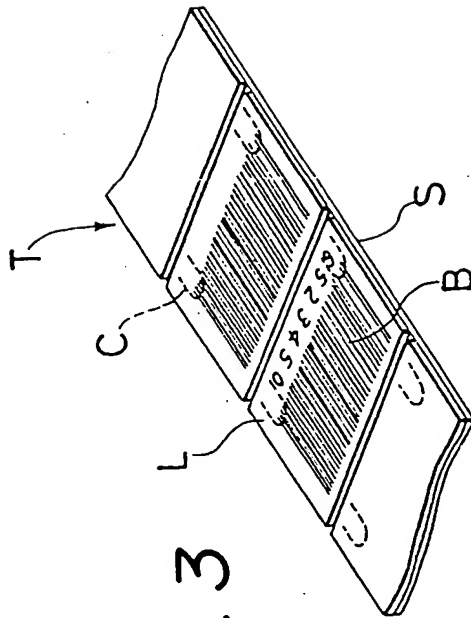


FIG. 3

FIG. 4

